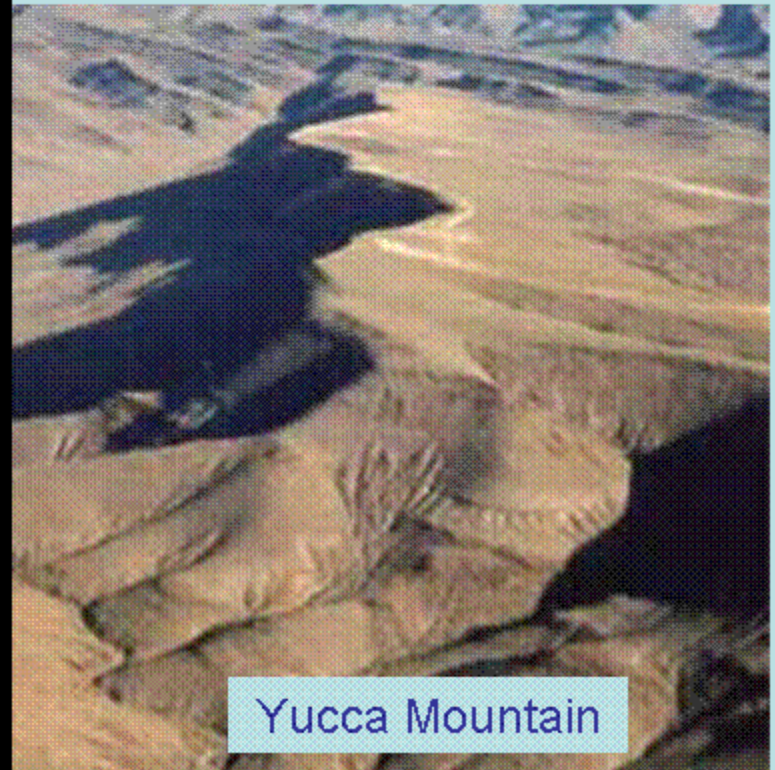
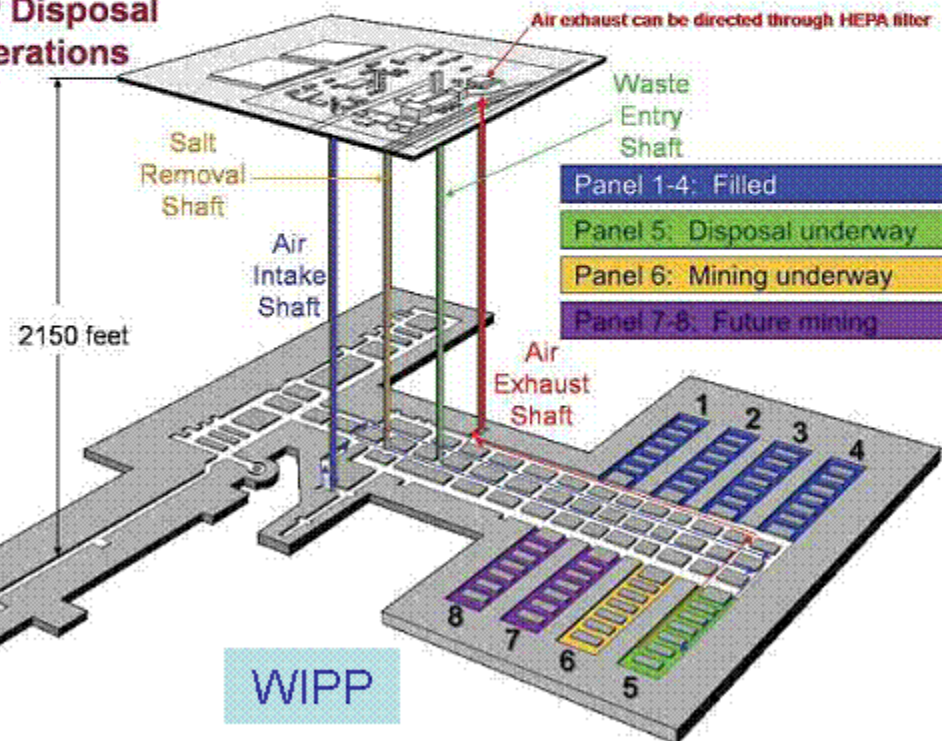


A remarkable study in contrast

>11 years **success**

>27 years of study – now victim
of **political assassination**

WIPP Disposal Operations

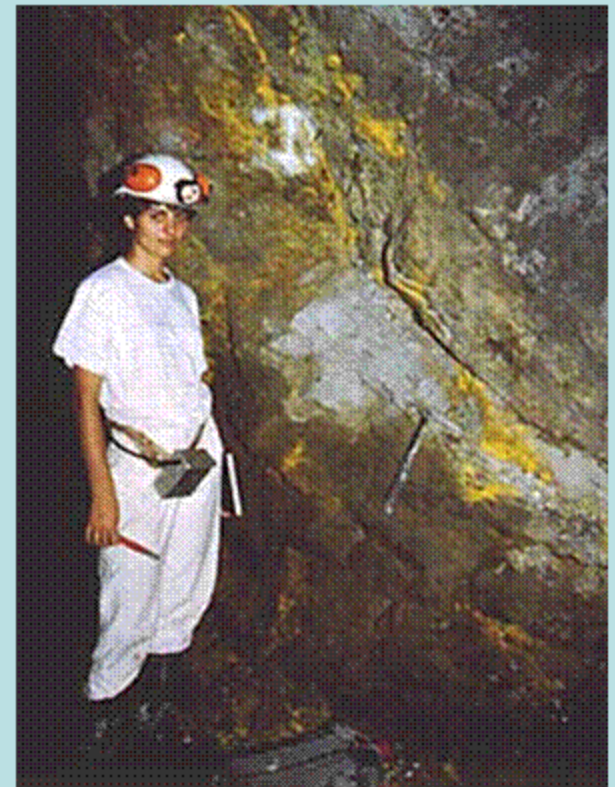
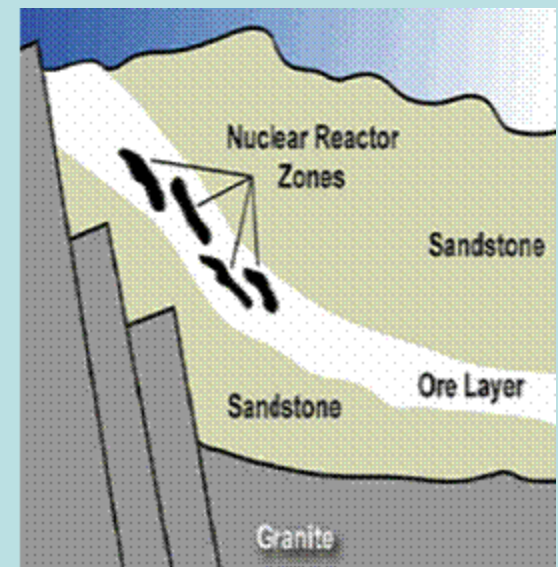


largely ignored by textbooks and little known

academically “hot” and well known

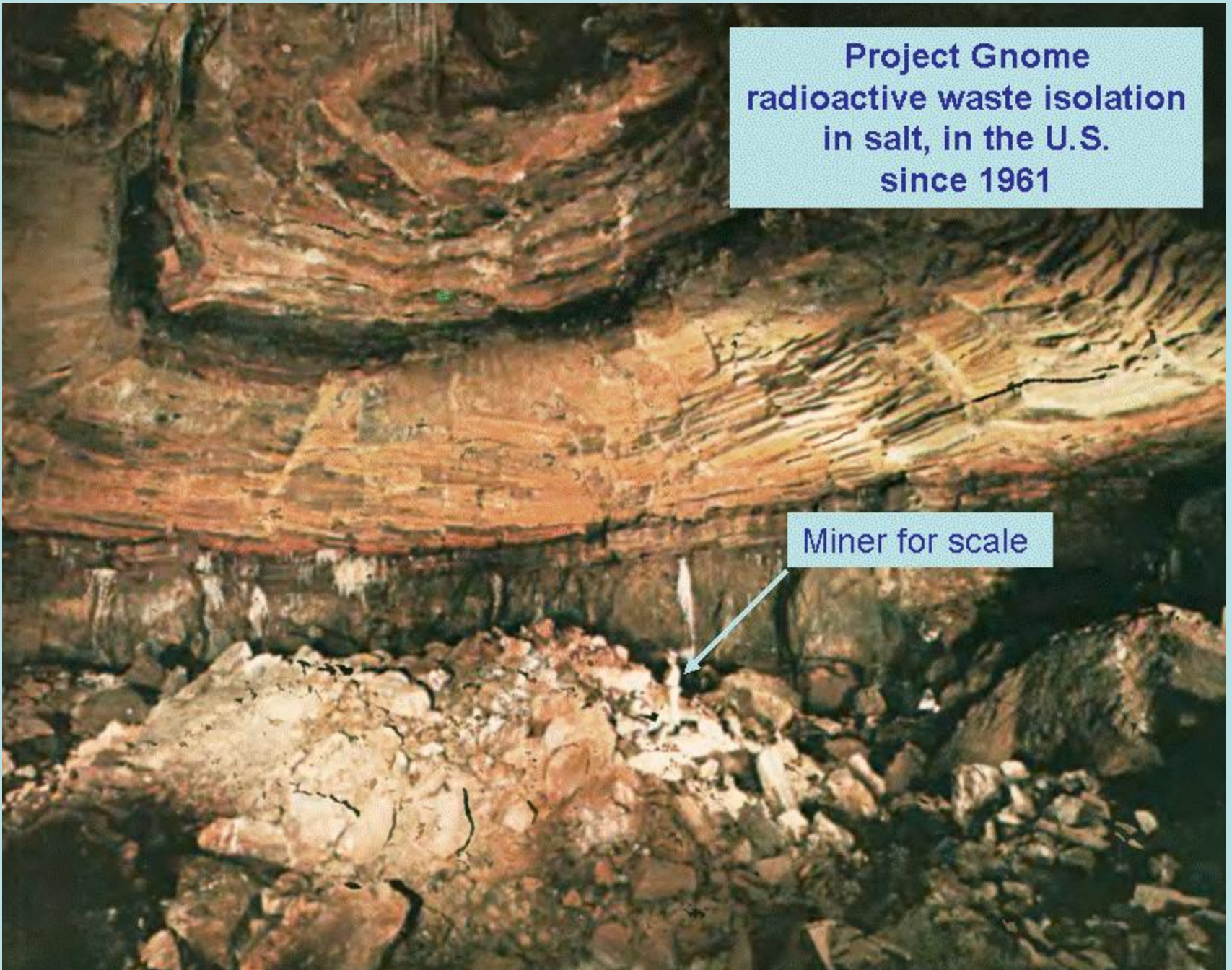
Oklo Nuclear Geysers (16 individual reactors)

- Operated 1.8 billion years ago,
 - for >150 000 years,
 - in 30-min pulses with 2.5 hr dormant periods,
 - consuming >5t U.
- Prove nuclear fission is natural.
- Suggest other natural reactors waiting to be found.



Project Gnome
radioactive waste isolation
in salt, in the U.S.
since 1961

Miner for scale

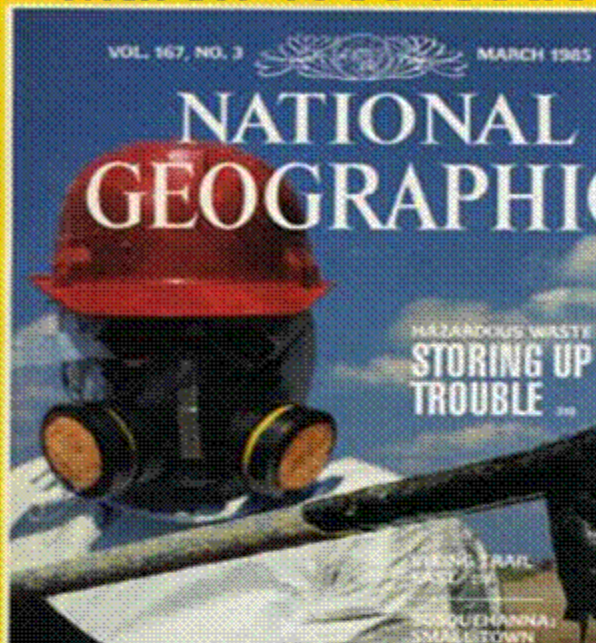


Gnome entailed higher risk than WIPP but caused no harm.

Lack of radionuclide migration from Gnome for half a century makes a good argument for long-term safety and environmental soundness of geologic salt repositories.

Gnome is a positive, beyond-worst-case analogue for geologic isolation in salt.

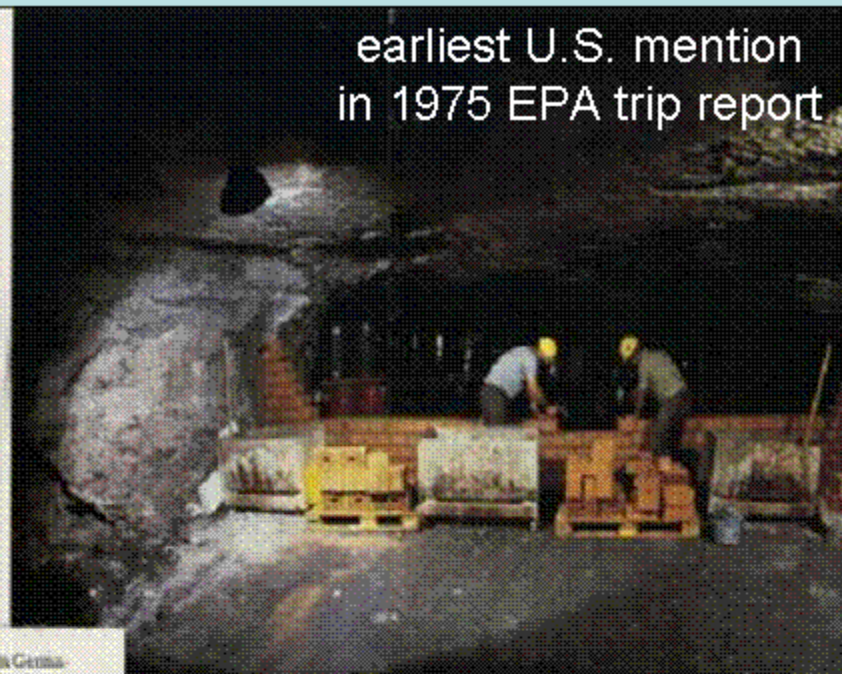
March 1985 issue



Storage that works. Using tunnels created by salt mining (right), Kall and Sells AG near Heringen, West Germany, stores solid waste in drums 2,300 feet below ground. Manager Norbert Debusch (above) shows the location of more than two million barrels. Dry, dry, and geologically stable, the facility is one of the world's safest.

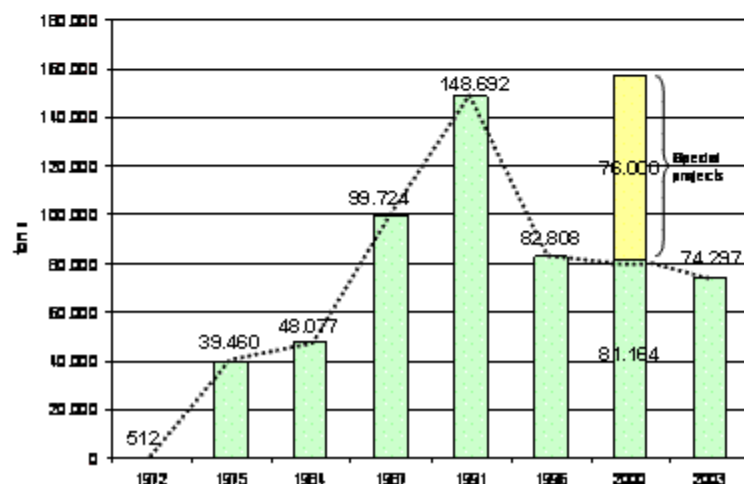
THE DYNAMICS of disposal in Germany

earliest U.S. mention
in 1975 EPA trip report

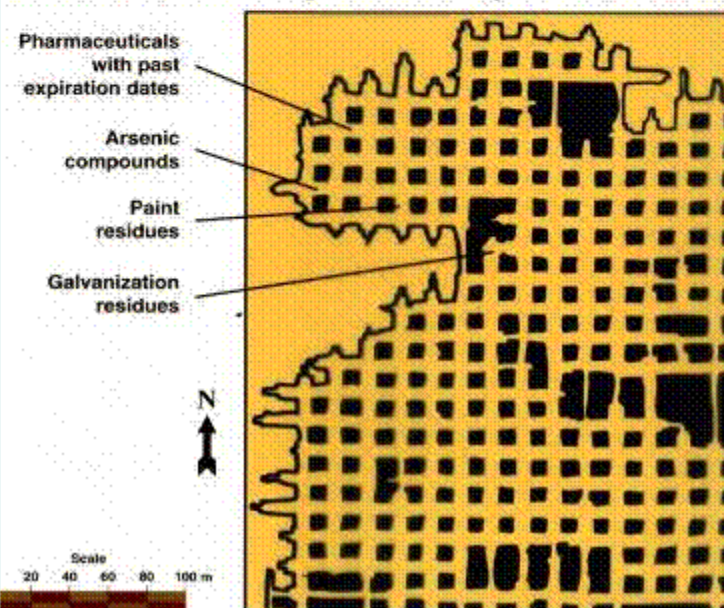


Since 1972

Disposal quantities Herfa-Neurode



Detail Map of Early Herfa Disposal Section



Deep geologic repositories in salt

Germany

U.S.A.

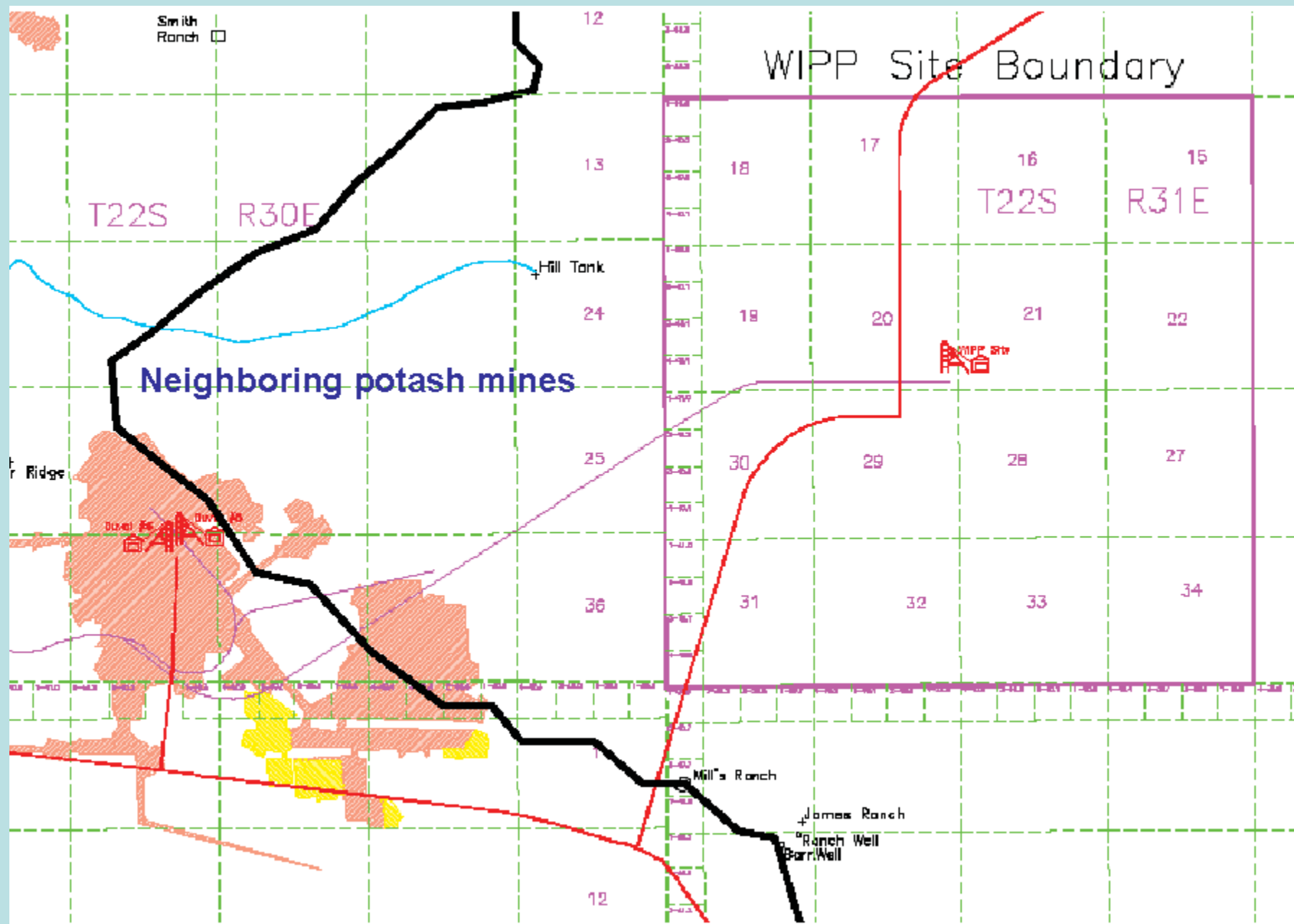


Flow is expected to be immeasurably slow..

(In halite) brine would take between 3 and 30 million years to flow 1m.

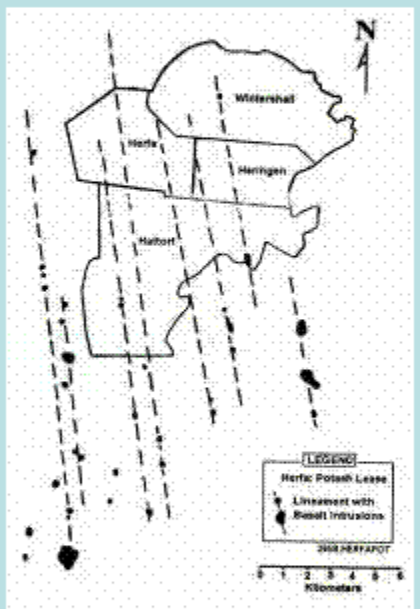
In anhydrite...brine would still take 30 000 to 300 000 years to flow 1m.

Beauheim, R. L., and Roberts, R. M.,
"Hydrology and hydraulic properties of a bedded evaporite formation",
Journal of Hydrology 259 (2002) 66-88





Carlsbad potash district, U.S.



Werra district, Germany

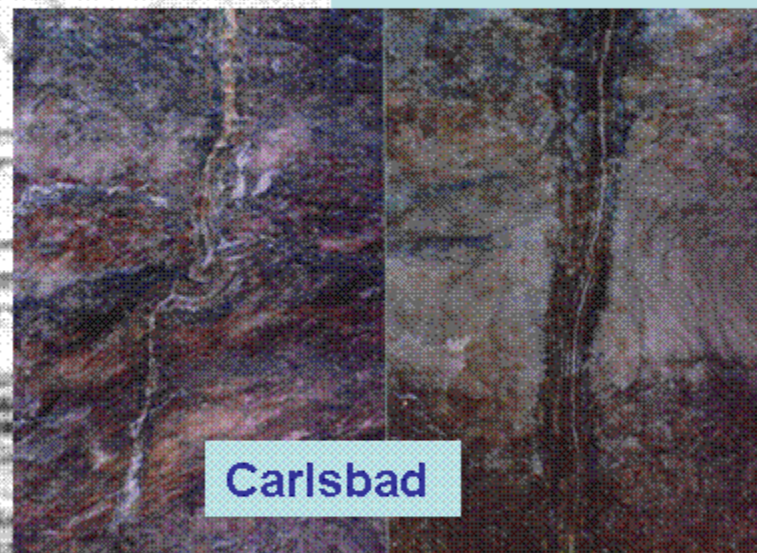
**Age of
salt:
>250
million
years**

Germany

**Basalt melt
~1150°C**

Dike 1-1.8m

**Salt temperature
<800°C at contact,
~200°C at 3m**



Carlsbad

**Age of
basalt:
~30
million
years**

Nature solved the radioactive waste “problem” 2 billion years ago.

Any state is a “nuclear” state.

An educated “anti-nuclear” person is an oxymoron.

William C. Clark, 1980: “Neither the witch hunting hysterics nor the mindlessly rigid regulations characterizing so much of our present chapter in the history of risk management say much for our ability to learn from the past”